# CHAPTER 5
# CROSS SECTION ELEMENTS

## 5.1 PAVEMENT TYPICAL SECTIONS

Roadway typical sections are developed for each different roadway type within the project. During the Pre-Design Conference, the actual typical section widths, slopes, and other geometric controls to be used will be determined as guided by the Design Standards. Page 4 of the Pre-Design Conference Memorandum will be reproduced to record design criteria for each roadway type.

The Department has developed typical section detail sheets using the Design Standards. If used, details should be checked to make sure that they meet the specific Design Standards applicable to the project, including modifications discussed at the Pre-Design Conference.

### 5.1.1 Pavement Type Determination & Structural Design

EDSM II.2.1.11 and II.2.1.12 discuss the steps required to determine the pavement type and structural design required for a project. This process is initiated within the Road Design Section by requesting that the District Administrator complete the Project Information Checklist. The completed checklist, traffic data, and a request for the subgrade soil survey are sent to the Pavement and Geotechnical Design Administrator, who is responsible for the preparation of the pavement structural design. When asphaltic concrete is specified for the pavement structure, the Pavement and Geotechnical Section will typically furnish the asphalt types. Additional information concerning asphaltic concrete types is provided in the Asphaltic Pavement Design and Specification Policy and Standards memorandum contained in the Highway Specifications Workbook.

### 5.1.2 Subgrade Considerations

The depth and type of treatment to the portion of subgrade directly below the base course will usually be as recommended by the Pavement and Geotechnical Design Administrator as a part of the pavement structural design, or as requested by the District during the Plan-in-Hand Inspection. Also, the condition of the existing ground should be observed during the Plan-in-Hand Inspection to determine if undercutting, mucking, lime treatment, or some other type of treatment will be required prior to placing the new embankment. If treatment is required, the soil borings will provide information on the depth of treatment that is necessary.

### 5.1.3 Drainage of Pavement Section

The presence of water under and within the roadway pavement section is extremely detrimental to the structural capacity and life expectancy of the pavement. EDSM II.2.1.8 provides guidance on the use of drainage layers and shoulder drainage systems that help remove trapped water. See Figure 5-1 for an example of a shoulder drain detail. To help prevent water from entering the pavement structure from beneath, the design high water elevation should be 2 ft below the base course, and roadside ditches should be set a minimum of 2 ft below the lowest part of the base course.

## 5.2 TYPICAL SECTION GEOMETRICS

As noted in Section 2.1.1, DOTD must follow AASHTO guidelines in the development of design standards. DOTD has produced Design Standards for freeways, arterials, collectors, and local roads and streets that meet these requirements. These standards delineate the approved geometric values to be used for both urban and rural roadways, at various design speeds and traffic volumes. Also shown are the values for lane widths, shoulder widths, side slopes, horizontal clearances (clear zones), right-of-way widths, and many others. These design values are shown in Section 2.2.

As noted in Section 5.1, the Pre-Design Conference Committee sets the approved values to be used. Should any value proposed be less than the Design Standards, a design exception will be required (see Section 2.3). EDSM I.1.1.5 contains additional information relating to typical sections. On federally funded projects, the typical section should be sent to FHWA for approval.

### 5.2.1 Travel Lanes

Travel lane widths are as noted in the Design Standards.

On higher-class highways, the pavement section is extended beyond the edge of travel lane to provide additional structural stability at the edge of travel lane. For all four-lane divided highways, the pavement section for the outside lane will extend three feet into the shoulder. On two-lane, two-way highways with traffic volumes greater than 2500 ADT and the percent trucks equal to or greater than 12 percent, the pavement section will extend 3 ft into the shoulders. The edge-line striping will be placed at the edge of the actual travel lane to delineate the correct lane width (see Figure 5-2).

The standard pavement cross-slope adopted by DOTD for travel lanes is 2.5 percent (0.025 ft/ft) (see Figure 5-3(a)).

### 5.2.2 Shoulders

As shown in Figure 5-3(a), the standard shoulder cross-slope adopted by DOTD for two-lane, two-way tangent roadways is 5 percent (0.05 ft/ft). As noted in the opening paragraphs of Section 5.2, this can vary depending on project specifics. For instance, on some projects the shoulder cross-slope matches the roadway cross-slope. On four-lane divided highways, the cross-slope on the median shoulder in tangent sections is controlled by the cross-over crown restrictions in Section 5.3, thus restricting the value to 4.5 percent (0.045 ft/ft) (see Figure 5-3(b)). Similarly, the outside shoulder cross-slopes (the convex side of the curve) on superelevated roadways will be controlled by the cross-over crown restrictions. As a result, the slope will depend on the superelevation rate (see Figure 5-4). On superelevated roadways, the inside shoulder will maintain its normal crown slope for superelevation rates equal to or less than the normal shoulder slope. For superelevation rates greater than the normal shoulder rate, the inside shoulder slope is the same as the superelevation rate. For additional discussion of superelevation, see Section 4.6.

On all rural four-lane highways and most rural arterial and freeway highways, shoulder rumble strips are used to alert motorists that they have strayed from the travel lane (see Figure 5-5). The attendees of the Pre-Design Conference or Plan-in-Hand Inspection may request rumble strips on other highways with high traffic volumes. Raised pavement markers can be used in place of formed rumble strips on concrete shoulders where traffic must use the completed shoulders during construction.

### 5.2.3 Clear Zone Requirements

A roadside recovery area, or clear zone, should be provided beyond the edge of travel lane and should be free of any non-traversable hazard or fixed object. This requirement is known as the clear roadside concept. The clear zone should be as wide as practical to allow the majority of vehicles that leave the roadway to recover. The recommended width for the clear zone depends on the functional classification of the roadway. The Design Standards mentioned in Section 2.2 show the minimum width required to provide an adequate clear zone.

If signs, lighting, traffic signal poles and/or other appurtenances are required within the clear zone, breakaway posts must be considered. Due to their size, weight and location, breakaway traffic signal poles may pose more hazards to the road users than an impact and may not be an appropriate application. Guardrail or other barriers may be required in certain locations to shield formidable obstacles that may be present within the clear zone. Safety requirements at bridge ends are one example of these locations and are further discussed in Section 5.8. AASHTO gives direction on horizontal clearance requirements and detailed guidance on the selection, location and design of traffic barriers in the Roadside Design Guide.

### 5.2.4 Roadside Slopes

DOTD Design Standards specify the maximum (steepest) side slope that can be used on a project in order to meet clear zone requirements. Where a range of slopes is given, the Designer should strive to provide the flatter slope, but slopes as steep as the maximum are permitted. Use of side slopes steeper than the maximum will require design exceptions.

When 6:1 fore slopes are used on roadways where the fill height exceeds 8 ft, the 6:1 fore slope is typically carried through the clear zone only. From that point, a 4:1 fore slope is used until it intercepts the existing ground or proposed ditch grade. This will help to minimize embankment and right-of-way requirements.

Side slopes of lateral ditches and ditch blocks along with embankment slopes for driveways within the right-of-way limits should provide the same reasonable opportunity for vehicle recovery as the main roadway fore slopes. Therefore, side slopes of these sections shall not be steeper than the fore slopes of the main roadway. Desirably, 6:1 maximum slopes should be used for these sections, and 10:1 slopes are preferred for median ditch blocks on multi-lane highways.

## 5.3 PAVEMENT CROWNS

1. <u>One-way Tangent Crown:</u> A one-way tangent crown slopes downward from left to right as viewed by the driver (see Figure 5-6). It is used for all roadways providing one-way traffic, except as noted in the following paragraphs.

2. <u>Two-way Tangent Crown:</u> A two-way tangent crown has a high point in the middle of the roadway and slopes downward toward both edges. It is used for all roadways providing two-way traffic (see Figure 5-7). For undivided multi-lane highways, the pavement is sloped downward and away from the median centerline, or from the left or right edge line of the median lane on a five-lane section.

3. <u>Two-way Crown Converted to One-way Use:</u> When an existing roadway with a two-way crown is converted from two-way to one-way use, the existing crown shape can remain.

4. <u>Cross-over Crown Break:</u> The cross-over crown break between main lanes is limited to an algebraic difference of 5 percent (0.05 ft/ft). This applies at the break point of a two-way crown. The algebraic difference between the main roadway cross-slope and shoulder cross-slope should not exceed 7 percent (0.07 ft/ft).

   The maximum 5 percent break also applies to the difference between the roadway cross-slope and an intersecting roadway grade, where the intersecting road is at a stop condition. Where the intersection will be signalized, or may be signalized in the future, the intersection should be designed using a maximum break of 2.5 percent. Additional discussion of intersection design can be found in Chapter 6 of this manual.

# 5.4 VERTICAL CLEARANCE

## 5.4.1 Roadway

Vertical clearances shown in the Design Standards apply to a structure over a roadway. These values include an additional six inches above the AASHTO recommended value to allow for future overlays. The point on the roadway where the critical clearance occurs will vary, depending on the cross-slope and longitudinal grade of both the under-passing and over-passing roadways.

When plans are prepared for overpass structures, the Bridge Design Section is responsible for ensuring that minimum clearances are provided. For reconstruction beneath an existing bridge that is to remain, the Designer is responsible for ensuring that minimum clearances are provided.

## 5.4.2 Railroads

The minimum vertical clearance required for a bridge structure over a railroad is 23 feet or as required by the owner of the railroad.

## 5.4.3 Waterways

The Bridge Design Section determines the vertical clearance required over waterways. This clearance is dependent on the type of navigation the waterway carries. Others involved in this determination are the Coast Guard, U.S. Army Corps of Engineers, waterway users, and port authorities.

## 5.4.4 Airways

FAA regulations require that an Airway-Highway Clearance Form be prepared whenever a project is constructed within two nautical miles of an airport. The Road Design Section has a manual that explains the requirements of this regulation. Included in the manual are layout maps of the airports that require this form. Sample formats of the form are also included, since the format varies depending on the proximity of the airport to the highway project.

## 5.5 CURBS

The type and location of curbs affects driver behavior and the safety and utility of a highway. Curbs serve any or all of the following purposes:

- drainage control
- pavement edge delineation
- right-of-way reduction
- esthetics
- delineation of pedestrian walkways
- reduction of maintenance operations
- assistance in orderly roadside development

In the interest of safety, curbs should not be used on rural highways if the same objective can be attained by other means.

Curbs may be mountable or barrier, concrete or asphaltic, and may be constructed by a variety of methods. EDSM II.2.1.7 outlines additional guidelines for the use of curb. Typical shapes and dimensions for various types of curbs, including curb and gutter, are shown in Figure 5-8.

### 5.5.1 Location Relative to Travel Lanes, Guardrail, etc.

For a normal roadway section with curb, the curb is offset from the through travel lane as shown in Figure 5-8. When used to delineate raised islands, like those commonly placed at intersections, the curb should be offset from the travel lane as discussed in Section 5.5.6. Additional discussion on the location of curbs is contained in Chapters IV and IX of the AASHTO Green Book.

The relationship of curb-to-guardrail is critical. If the curb is not located properly, the guardrail will not function as intended. Chapter 5 of the Roadside Design Guide discusses the location of curb with respect to the face of the guardrail.

### 5.5.2 Types

1. Mountable or Barrier: Curb shapes are generally classified as either mountable or barrier. The typical mountable curb has a flat sloping face and is one foot wide by four inches high. The typical barrier curb has a steep face and is six inches wide by six inches high.

   Generally, barrier curb is only used when sidewalks are provided and in the curb return of turnouts to intersecting streets. Also, if a municipality requests that provisions be made for future sidewalks, barrier curb should be used.

2. Concrete or Asphaltic: Portland cement concrete is used for most curbs. Asphaltic curbs are limited primarily to median curbs on overlay projects.

### 5.5.3 Method of Construction

1. Integral: For concrete pavements, integral curb is preferred to curb and gutter because of economy in initial construction and maintenance. With this method, the concrete curb is poured when the concrete slab for the roadway is still in a plastic state. This creates an integral bond between the roadway and the curb (see Figure 5-8(a & b). An alternate, and more popular, method of construction is to place dowel bars in the plastic concrete of the roadway slab, as shown in Figure 5-8(c through e). Later, when the pavement has hardened, the curb is poured so that the dowel bars hold the curb firmly in place on the roadway. Although not truly integral with the pavement, this curb is commonly referred to as integral curb.

2. Curb and Gutter: Concrete curb and gutter, as shown in Figure 5-8(f through l), is generally used with asphaltic concrete pavement. Under this method, both the curb and the gutter are poured together, but not at the same time as the roadway pavement. Widths vary from 1.5 ft to 2.5 ft, with 2 ft being the most common width for both mountable and barrier types as shown in Figure 5-8(f through h). Where curb and gutter is placed adjacent to concrete pavement on curved sections, dowel bars should be used to connect the curb and gutter to the adjacent pavement. This prevents separation of the curb and gutter from the edge of the pavement.

3. Plain: Plain concrete curb, as illustrated in Section H-H of Figure 5-9, is generally used in small quantities adjacent to an existing pavement, driveway, or parking area. While this curb requires a relatively large amount of concrete for stability, it is usually preferred over curb and gutter (for small quantities) because of the savings in labor required for forming and finishing.

4. Extruded: This method is commonly used for combination curb and gutter and asphaltic curbs. Extruded curb is placed by machine with no forms required.

### 5.5.4 Curb Detail at Driveways

1. Mountable Curb: The standard four-inch high mountable curb is reduced to two-inches in height across the full width of the driveway, including radii or flares. Driveway details that illustrate the reduction in curb height are shown in Figures 5-9 and 5-10. Persons applying for a permit to build a driveway after completion of the project have the option of connecting the

driveway flush with the top of the existing curb or reconstructing the curb, as noted above.

2. Barrier Curb: When barrier curb is used, it is reduced in height at driveway locations by a method similar to that used for mountable curb.

3. Curbed Driveways: Driveways are curbed only for the conditions described below:

   a. Replacement of Existing: If the existing driveway is curbed, it will be replaced with a curbed driveway. For a single driveway that is curbed, both sides of the driveway will be curbed, using the curb shown by Section E-E in Figure 5-9.

   b. Adjacent to Curbed Island: When a curbed island is used outside of the roadway, the opposite edges of the driveways shall also be curbed (see Figure 5-9).

4. Curbed Islands: Curbed islands in conjunction with driveways are used only for the conditions described below.

   a. Replacement of Existing: An existing curbed island should be replaced as shown in Figure 5-9.

   b. Service Stations: If a pump island at a service station is less than 10 ft from the right-of-way line, a curbed island must be placed with a line of barrier curb running along the right-of-way line as shown in Figure 5-9. This is to prevent vehicles from being served on highway right-of-way.

   c. Continuously Paved Area: If continuous pavement is located adjacent to the highway right-of-way where more than one driveway is required, an island should be placed between driveways to control access.

   d. Access Control: Curbed islands may be placed in other areas as recommended by the Plan-in-Hand Party if it appears that access control will be a problem. For example, a curbed island could be placed to prevent vehicles from parking on the highway right-of-way.

### 5.5.5 Raised Median Noses

To prevent vehicles from breaking the curb in the nose of raised median, a monolithic section of curb and median pavement should be constructed. See Figure 5-11 for example details.

### 5.5.6 Curbed Islands

Curbed islands help control and direct the movement of traffic by reducing excess pavement areas. In urban locations, mountable curb is typically used in conjunction with striping to delineate the island. In rural locations where higher speeds are likely, islands are typically delineated with mountable curb as discussed in EDSM No. II.2.1.7.

Figures 5-12 and 5-13 show island design details for pavements with and without shoulders, respectively. The island size is typically as follows:

- Small – Area 50 to 100 square feet with sides in excess of 12 ft to 15 ft
- Large – Area in excess of 100 sq ft (used at isolated intersections on high-speed highways)

Curbs should be offset from the travel lane as shown in Figures 5-12 and 5-13 and the noses rounded appropriately. Additional discussion is contained in Chapter IX of the AASHTO Green Book.

## 5.6 SIDEWALKS

### 5.6.1 General

Requirements for construction of sidewalks are contained in EDSM II.2.1.10. During the Pre-Design Conference, the need for sidewalks should be discussed with the District representative. If it appears that sidewalks are warranted, the District representative should discuss the requirements with local officials and obtain tentative agreement to the stipulations in the EDSM from the municipality. Notes concerning sidewalks will be included in the Pre-Design Conference Report and the sidewalks included in the preliminary plans.

The Designer will send a written request to the Contracts Management Section relaying the verbal agreement and requesting that a formal agreement be prepared as such. After the city-state agreement is prepared, the Contracts Management Section will send it to the municipality for their approval and agreement to the stipulations in the EDSM. If a signed agreement is not received, the sidewalks will be removed from the plans before the construction letting.

If a municipality requests that provisions be made for a future sidewalk, barrier curb should be used along the roadway. This request should be documented in the plans and project files.

### 5.6.2 Location

The Design Standards recommend that sidewalks be at least 4 ft wide. Sidewalks are normally offset 2 feet or more from the back of curb, with a grass berm separating the curb and walk. If a sidewalk is placed adjacent to the curb, it must be at least 6 ft wide and a barrier curb will be required (see Figure 5-14 for typical sidewalk locations). The city, or authority responsible for sidewalk maintenance (including the grass berm, if required), may choose a location and width greater than the minimum values, if they prefer.

### 5.6.3 Cross-slope

In accordance with the Americans with Disabilities Act (ADA), sidewalk cross-slopes will be no greater than 2.0 percent (positive or negative).

### 5.6.4 Handicap Ramps

In order to comply with the Americans with Disabilities Act (ADA), handicap ramps will be included on all projects that contain both sidewalks and curbs. See Standard Plan HR-01 for details.

### 5.6.5 Bridges

EDSM II.3.1.4 provides guidance on the placement of sidewalks on bridges in urban areas. The preferred option for bridge configuration is shown in Section II.B.2.a of the EDSM, unless circumstances dictate otherwise.

## 5.7 BARRIERS

### 5.7.1 General

Chapters 5 and 6 of the AASHTO Roadside Design Guide provide details on the application and design of various barriers, including guardrail and concrete median barriers. Recommendations on the layout and type of barrier to be used are usually obtained from the Bridge Design Section when bridges are involved. All other applications are the responsibility of the Designer, but the Bridge Design Section will provide guidance as needed.

### 5.7.2 Guardrail

The types of guardrail normally specified are W-Beam and Thrie Beam. The actual construction details and uses are shown in various standard plans and in the project plans (see Standard Plans GR-200, GR-201, GR-202, GR-203A, and GR-203B).

### 5.7.3 Concrete Barrier Rail

Concrete barriers are designated by the shape of the barrier face adjacent to traffic (G.M., New Jersey, F., Single Slope, Safety Shape, etc.) and will be detailed in the plans when required. Figure 5-15 shows typical barrier types. Details showing the construction requirements are available from the Bridge Design Section.

## 5.8 EMBANKMENT WIDENING FOR GUARDRAIL AT BRIDGES

Guardrail is normally placed at the approach end of bridges to protect vehicles from the blunt end of the bridge railing. It provides a roadside barrier that transitions the rigid bridge railing to a more flexible, forgiving system for the length required in advance of the bridge end. In some instances, the guardrail also protects vehicles against obstacles behind the bridge rail or areas that do not meet clear zone requirements.

The roadway embankment should be widened at these locations with relatively flat slopes to allow the guardrail to be properly placed and function as designed. The slopes of embankment widening are typically 10:1 maximum, but occasionally are designed to match the shoulder slopes.

To reduce maintenance adjacent to the guardrail and guardrail posts, the embankment widening is usually paved. Typically, the asphaltic concrete pavement types and thicknesses used for the shoulder are extended through the widening section as shown in Figures 5-16 and 5-17. Occasionally, the plan-in-hand party will recommend other types of pavement in lieu of the asphalt section.

Details of the embankment widening layout are placed in the plans, normally with the typical section sheets. The Bridge Design Manual and the guardrail standard plans contain additional information concerning the layout of the guardrail and embankment widening.

# 5.9 MEDIANS

## 5.9.1 General

Medians are areas provided on divided roadways to separate opposing lanes of traffic and may be either depressed or raised. The median width is measured between the edges of the inside travel lanes. See Section 6.2.2 for a discussion of left turn lane design, and Section 6.6 for a discussion of median openings.

## 5.9.2 Rural

DOTD Design Standards contain the desirable depressed median widths for use on rural projects. The use of the desirable values must be weighed against the social, economic, and environmental impacts. Should constraints require a lesser value or require a raised median, a design exception will be required (see Section 2.3). Figure 5-18 shows an example of a depressed median section for a rural roadway.

## 5.9.3 Urban

As shown in Figure 5-19, a 14 ft flush median is commonly used as a continuous left turn lane on urban arterials and collectors. The continuous left turn is used to:

- reduce travel time
- improve capacity
- reduce accident frequency (particularly rear-end accidents)
- facilitate maintenance of through traffic during construction or lane-closure of a through lane

If requested by the municipality and if proper median maintenance agreements are obtained, raised, grassed medians as shown in Figure 5-20 may be used in special situations. Raised, grassed medians are used to regulate left turn movements, provide positive separation of opposing lanes of traffic, and, where properly maintained, provide a more esthetically pleasing roadway.

# 5.10 FRONTAGE ROADS

## 5.10.1 General

Frontage roads provide numerous functions depending on the type of arterial they serve and the character of the surrounding area. They may be used to control access to the arterial, to accommodate adjoining property, and to maintain traffic circulation on each side of the arterial. Frontage roads segregate local traffic from the higher-speed through traffic and intercept driveways from residences and commercial establishments along the highway. Most existing frontage roads were built along interstate or major arterial routes to provide control-of-access to the highway and access to property that would otherwise be land-locked.

### 5.10.2 Functional Classification and Design Standards

Each segment of a new frontage road is usually short and traffic volumes are usually low. As a result, most new frontage roads could be classified as collector roads. After the appropriate classification is determined, the corresponding Design Standards are used.

## 5.11 RIGHT-OF-WAY CONTROLS

### 5.11.1 General

Establishing right-of-way widths that adequately accommodate construction, utilities, drainage, and proper highway maintenance is an important part of the overall design. A wide right-of-way width permits the construction of gentle slopes, which results in greater safety for motorists and in easier and more economical maintenance of the right-of-way. The Design Standards include minimum right-of-way widths for roadways built on new location.

### 5.11.2 Rural

In hilly terrain, construction limits vary considerably as the roadway passes through cut and fill sections. In this situation, the required right-of-way varies, so it is impractical to use a constant right-of-way width. In flat terrain, it is usually both practical and desirable to establish a minimum right-of-way width that can be used throughout most of the project length. Required right-of-way widths should be set at even offsets from the centerline, typically multiples of 5 feet, unless some physical feature requires otherwise. Transitions in width, where required, should be as long as practical. If frequent breaks in the right-of-way line are required to increase the width by only 5 feet, for example, serious consideration should be given to increasing the minimum width by 5 feet for the entire project length. As a general rule, the required right-of-way line should be set a minimum of 10 feet beyond the proposed limits of construction (see EDSM II.1.1.1)

If a future project will potentially connect to either end of the proposed project, the required right-of-way line is extended to the nearest property line beyond the extent of construction, if practical. This is done to avoid buying right-of-way from the property owner on two different occasions. In this case, the project limit will correspond to the limit of the required right-of-way.

### 5.11.3 Urban

In urban areas, right-of-way widths are governed primarily by economic considerations, physical obstructions, or environmental considerations. Along any route, development and terrain conditions may vary affecting the availability of right-of-way.

The minimum width of right-of-way is shown in the Design Standards. However, the right-of-way width should be sufficient to accommodate the ultimate planned roadway, including:

- median
- shoulder
- grass strip
- sidewalks
- public utility facilities
- width for necessary outer slopes, except where they are within an obtained easement

It is desirable to set right-of-way in urban areas a minimum of 6 ft to 10 ft beyond the limits of construction to easily relocate utilities. However, property or environmental impacts discussed above may limit the amount of right-of-way that can realistically be acquired. If existing utilities are in conflict within areas of restricted right-of-way, discussions should be held at the Plan-in Hand to determine how to adequately accommodate utility relocations.

### 5.11.4 Special Types of Right-of-Way

1. Construction Servitude: Construction servitude is called for on the plans when an area outside the required right-of-way line is needed only during construction of the project. The most common example of this is for construction of a temporary detour road.

   A permanent feature should not be placed in a construction servitude. The decision to obtain permanent right-of-way or construction servitude is made after considering the circumstances of each project.

   The property owner is paid a rental fee during the time the construction servitude is needed. Where applicable, the owner is also paid for damages that may be incurred during the construction process such as for removal of trees or shrubbery.

2. Drainage Servitude: Drainage servitude is required when a new lateral outfall ditch is to be constructed beyond the right-of-way or when an existing lateral outfall ditch is to be improved outside of the right-of-way. Drainage servitude is obtained when construction of these laterals is critical to proper drainage of the project. As with a construction servitude, the property owner is paid for use of the drainage servitude and for

damages resulting from construction. However, with drainage servitude, the Department reserves the right of permanent access to the lateral for maintenance purposes.

3. Right-of-Way Agreement (Right of Entry): In cases where yard drains are installed or where driveways are extended beyond the right-of-way line, it is not necessary to show the exact construction limits of these items on the plans. Permission to construct these items, which are for the property owner's benefit, will be obtained by the Real Estate Section. This occurs after the Road Design Section advises the Real Estate Section of the properties that require right-of-way agreements. The Project Engineer can also obtain right-of-way agreements during construction.

   The preferred method of transmitting this information to the Real Estate Section is by letter, noting the fact that right-of-way agreements are required for the completion of the construction. A simple note saying "R/W Agreement Req'd.," with an arrow drawn to the proposed yard drain or driveway extension, is shown on the plans transmitted with the letter. This note is not included on the Final Plans.

4. Control of Access: Control of Access (C of A) is purchased from property owners along major highways such as freeways. No highway access crossing the C of A is allowed, and the property owner is compensated for such restrictions. Where C of A is used along a highway, it typically extends down intersecting roadways to enhance traffic flow at the intersection. Section 3.4 of this manual and EDSM III.1.1.14 contain additional discussion of C of A.

### 5.11.5 Accommodating Utilities

In addition to primarily serving vehicular traffic, right-of-way for streets and highways may accommodate public utility facilities in accordance with state law or municipal ordinance. Use of right-of-way by utilities should be planned to cause the least interference with traffic using the street. The border area between the roadway and the right-of-way line should be wide enough to serve several purposes. These include provision of a buffer space between pedestrians and vehicular traffic (if applicable), subsurface drainage, sidewalk space, and an area for both underground and aboveground utilities. If existing utilities are in conflict within areas of restricted right-of-way, discussions should be held at the Plan-in Hand to determine how to adequately accommodate utility relocations. Utility features, such as power poles and fire hydrants, should be located as close to the right-of-way line as feasible for safety reasons. Discussion concerning utility relocation is contained in Section 4.5.6 of this manual.

### 5.11.6 Expropriation

During the right-of-way acquisition process, there are occasions when the Real Estate Section has difficulty reaching an agreement with property owners on fair compensation for property and damages. During negotiations, the Designer may be asked by the Real Estate agent to review the parcel(s) to determine if impacts can be reduced or eliminated.

When negotiations with a property owner fail to obtain the property required to construct a project, the next step to acquire this property is through expropriation. EDSM II.1.1.2 outlines the policy for this action.

### 5.11.7 Existing Right-of-Way

An effort is made to accurately determine the location of existing right-of-way and property lines before the required right-of-way is set. This is partly done to avoid acquiring unusually small parcels and/or to avoid allowing unusually small parcels to remain. As a first step in the preparation of the right-of-way maps, a base map is prepared. This map includes information obtained from the property survey, detailing the existing right-of-way and property lines throughout the project. When this base map is available, a copy should be requested for use in setting the required right-of-way.

### 5.11.8 Encroachments

If additional right-of-way is required, buildings that encroach on the existing right-of-way are handled the same as other buildings that fall within the required right-of-way. However, if no additional right-of-way is required, the property owner must remove all encroaching buildings, fences, etc. Road Design will send a letter to the Real Estate Section outlining possible encroachments. The Real Estate Section then advises the District Administrator of each property that indeed has encroachments within the existing right-of-way. On 100 percent state financed projects, minor encroachments that would not interfere with proposed construction and that do not violate the clear roadside concept (clear zone) are permitted to remain. However, this is only after instructions have been received for the specific project from a higher authority (see EDSM IV.1.1.9).

### 5.11.9 Disposal of Right-of-Way

EDSM I.1.1.10 and I.1.1.19 provide guidance on Department policy for disposing of right-of-way. If the Department is disposing of excess right-of-way, the Road Design Section will normally be asked to verify that the property will not be needed for future projects, or that the right-of-way disposal would not be detrimental to the operation and maintenance of the existing highway. When a roadway on new alignment renders an existing state route unneeded, the Road Design Section will request that the Office of Planning and Programming obtain the necessary agreements to dispose of the abandoned roadway. Typically, the city or parish involved will assume responsibility for the abandoned roadway.

## 5.12 ROADSIDE CONTROLS

The efficiency and safety of a highway without control of access depend greatly upon the amount and character of roadside interference. Most interference originates in vehicle movements to and from businesses, residences, or other development along the highway. Abutting property owners have rights of access but DOTD is empowered to regulate and control the location, design, and operation of access driveways and other roadside elements, such as mailboxes, in order to minimize interference to the movement of through traffic. Interference resulting from indiscriminate roadside development and uncontrolled driveway connections results in lowered capacity, increased safety hazards, and early highway obsolescence. For more information, driveways are discussed in Section 6.7, and mailboxes are discussed in EDSM I.1.1.17.

## 5.13 PARKING LANES

### 5.13.1 Policy

Generally, parking on arterial highways should be prohibited because on-street parking decreases through capacity, impedes traffic flow, and increases accident potential. At the request of the local governing authority, consideration should be given to the inclusion of parking adjacent to the roadway in special situations if the following conditions are met:

1. Parking currently exists adjacent to the roadway.
2. Adequate off-street parking facilities are unavailable or unfeasible.
3. The subsequent reduction in highway capacity will be insignificant.
4. The local governing authority has agreed to pay for the additional costs associated with the parking, such as additional right-of-way, construction costs, etc.

Final approval will be obtained from the Chief Engineer.

### 5.13.2 Application

When on-street parking is allowed on a roadway, parallel parking is the preferred method. Under certain circumstances, angled parking is allowed. The type of on-street parking selected should depend on the specific function and width of the street, the adjacent land use and traffic volume, as well as existing and anticipated traffic operations. Angled parking presents sight distance problems due to the varying length of vehicles, such as vans and recreational vehicles. The extra length of these vehicles may also interfere with the traveled way.